

No.

200000251



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW. NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN, FIELD

'PH4TW'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this thirtieth day of January, in the year two thousand two.

Attest:

Paul M. Jubert

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Arthur C. Freeman

Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER		3. VARIETY NAME PH4TW	
4. ADDRESS (Street and No. or RFD No., City, State and Zip Code, and Country) 7301 NW 62nd Avenue P.O. Box 85 Johnston, IA 50131-0085		5. TELEPHONE (include area code) 515/270-4051		FOR OFFICIAL USE ONLY PVPO NUMBER 200000251	
		6. FAX (include area code) 515/253-2125			
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Corporation		8. IF INCORPORATED, GIVE STATE OF INCORPORATION IOWA		9. DATE OF INCORPORATION March 5, 1999	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION (FIRST PERSON LISTED WILL RECEIVE ALL PAPERS) Steven R. Anderson Research and Product Development P.O. Box 85 Johnston, IA 50131-0085				FILING DATE 5/17/00	
11. TELEPHONE (include area code) 515/270-4051		12. FAX (include area code) 515/253-2125		FILING & EXAMINATION FEES: \$ 2450.00 DATE 5-17-00	
13. E_MAIL ANDERSONS@PHIBRED.COM		14. CROP KIND NAME (Common name) CORN		CERTIFICATION FEE: \$ 320.00 DATE 1/16/02	
15. GENUS AND SPECIES NAME OF CROP Zea Mays		16. FAMILY NAME (Botanical) Gramineae <i>SRM 12/6/00</i>		17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow Instructions on reverse)		19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act) <input type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no", go to item 22)			
a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of the Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,450), made payable to "Treasurer of the United States" (Mail to Plant Variety Protection Office)		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input type="checkbox"/> NO			
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U.S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse)		21. IF "YES" TO ITEM 20, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED			
23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		24. The owner(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and results in penalties.			
SIGNATURE OF OWNER NAME (Please print or type) Steven R. Anderson		SIGNATURE OF OWNER <i>Steven R. Anderson</i> NAME (Please print or type) Steven R. Anderson			
CAPACITY OR TITLE DATE		CAPACITY OR TITLE Senior Research Associate DATE 5/12/2000			

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety protection Office (PVPO), ALL of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed Exhibits A,B,C,E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety sy lrsdy 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (in the sense that it will reproduce an entire plant) tissue culture will be deposited and maintained in a approved public repository; (4) check drawn on a U.S. bank for \$2,450 (\$300 filing fee and \$2,150 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 500, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. DO NOT use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$300 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office

Telephone: (301)504-5518

FAX: (301)504-5291

Homepage: <http://www.ams.usda.gov/science/pvp.htm>

ITEM

- 18a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified.
- 18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens of photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 18c. Exhibit C forms are available from the PVPO for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant disease resistance, etc.
- 18e. Section 52(5) of the Act required applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
19. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant may NOT reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, applicant may change the choice. (See *Regulations and Rules of Practice, Section 7.103*).
22. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
23. See Section 5.5 of the Act for instructions on claiming the benefit of an earlier filing date.

22. CONTINUED FROM FRONT (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

Nov. 1, 1999; United States, Canada

23. CONTINUED FROM FRONT (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of Regulations and Rules of Practice.)

To avoid conflict with other variety names in use, the applicant should check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate of any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Agriculture, Clearance Officer, OIRM, AG Box 7630, Jamie L. Whitten Building, Washington, D.C. 20250. When replying, refer to OMB No. 0581-0055 and form number in your letter. Under the PRA of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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Exhibit A. Origin and Breeding History

200000251

Pedigree: PHKM5<2PHRE1)7632X

Pioneer Line PH4TW, *Zea mays L.*, a dent-like corn inbred, was developed by Pioneer Hi-Bred International, Inc. from the single cross hybrid PHKM5 (Certificate No. 9400097) X PHRE1 (PVP Certificate No. 9300114) using the backcrossing and pedigree method of plant breeding. Varieties PHKM5 and PHRE1 are proprietary inbred lines of Pioneer Hi-Bred International, Inc. Selfing was practiced (after 2 generations of backcrossing) for 5 generations using pedigree selection. During line development, crosses were made to inbred testers for the purpose of estimating the line's combining ability. Yield trials were grown at Moorhead, Minnesota as well as other Pioneer research locations. After initial testing, additional hybrid combinations have been evaluated and subsequent generations of the line have been grown and hand-pollinated with observations again made for uniformity.

Variety PH4TW has shown uniformity and stability for all traits as described in Exhibit C - "Objective Description of Variety". It has been self-pollinated and ear-rowed 5 generations with careful attention paid to selection criteria and uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observations for uniformity and stability for 4 generations during the final stages of inbred development and seed multiplication. Very high standards for genetic purity have been established morphologically using field observations and electrophoretically using sound lab molecular marker methodology.

No variant traits have been observed or are expected in PH4TW.

The criteria used in the selection of PH4TW were yield, both per se and in hybrid combinations; late season plant health, grain quality, stalk lodging resistance, and kernel size, especially important in production. Other selection criteria include: ability to germinate in adverse conditions; number of tillers, especially important in production because having numerous tillers increases hybrid production costs spent on detasseling; disease and insect resistance; pollen yield and tassel size.

Exhibit A: Developmental history for PH4TW

200000251

Season/Year Pedigree Grown	Inbreeding Level of Pedigree Grown
Summer 1990 PHKM5, PHRE1	F0
Winter 1990 PHKM5/PHRE1	F1
Summer 1992 PHKM5<2PHRE1	BC1F1
Summer 1993 PHKM5<2PHRE1)7	BC1F2
Summer 1994 PHKM5<2PHRE1)76	BC1F3
Summer 1996 PHKM5<2PHRE1)763	BC1F4
Winter 1996 PHKM5<2PHRE1)7632	BC1F5
Summer 1997 PHKM5<2PHRE1)76322	BC1F6
Seed Bulk PHKM5<2PHRE1)7632X	BC1F6

*PH4TW was selfed and ear-rowed from BC1F2 through BC1F6 generation.

#Uniformity and stability were established from BC1F3 through BC1F6 generation and beyond when seed supplies were increased.

Exhibit B: Novelty Statement

Variety PH4TW mostly resembles Pioneer Hi-Bred International, Inc. proprietary inbred line PHKM5 (PVP Certificate No. 9400097). The data in Tables 1A and 1B are from paired comparisons collected primarily in Johnston and Ankeny, IA. The traits collectively show measurable differences between the two varieties.

Variety PH4TW has wider cob diameter (19.1 mm vs 15.2 mm) than variety PHKM5 (Table 1A, 1B).

Variety PH4TW has lower ear weight (31.9 g vs 44.0 g) than variety PHKM5 (Table 1A, 1B).

Variety PH4TW has shorter kernel length (6.9 mm vs 9.2 mm) than variety PHKM5 (Table 1A, 1B).

Variety PH4TW has more leaf number (# of leaves/plant) (16.6 vs 14.9) than variety PHKM5 (Table 1A, 1B).

Variety PH4TW has more tassel primary branches (# of primary branches) (8.9 vs 3.9) than variety PHKM5 (Table 1A, 1B).

A t-test was used to compare differences between means and the appropriate parameters have been included. It is difficult to collect standard deviations for table 2 due to the way the historical data was stored.

JMS
12/14/01

Exhibit B Novelty Statement Tables

Exhibit B: Novelty Statement Tables

Table 1A: Data from Johnston, IA at 3 different environments in 1999 are supporting evidence for differences between PH4TW and PHKM5 Locations had different environmental conditions. Environments had different planting dates and were in different fields.

Year	Traits	Variety-1	Variety-2	Count-1	Count-2	Mean-1	Mean-2	Mean Diff	StdDeviat on-1	StdDeviat on-2	StdErro r-1	StdErr or-2	DF Pooled	t-Value Pooled	Prob (2-tail) Pooled
1999	cob diameter (mm)	PH4TW	PHKM5	5	5	20.2	15.8	4.4	1.095	1.095	0.490	0.490	8	6.35	0.000
1999	cob diameter (mm)	PH4TW	PHKM5	5	5	18.6	15.0	3.6	1.517	0.707	0.678	0.316	8	4.81	0.001
1999	cob diameter (mm)	PH4TW	PHKM5	5	5	18.4	14.8	3.6	0.894	0.447	0.400	0.200	8	8.05	0.000
1999	ear weight (g)	PH4TW	PHKM5	5	5	33.2	47.4	-14.2	6.496	7.701	2.905	3.444	8	-3.15	0.014
1999	ear weight (g)	PH4TW	PHKM5	5	5	32.4	42.6	-10.2	7.470	3.209	3.341	1.435	8	-2.81	0.023
1999	ear weight (g)	PH4TW	PHKM5	5	5	30.0	42.0	-12.0	3.391	3.742	1.517	1.673	8	-5.31	0.001
1999	kernel length (mm)	PH4TW	PHKM5	5	5	7.2	9.8	-2.6	0.447	0.447	0.200	0.200	8	-9.19	0.000
1999	kernel length (mm)	PH4TW	PHKM5	5	5	6.6	9.2	-2.6	0.548	0.447	0.245	0.200	8	-8.22	0.000
1999	kernel length (mm)	PH4TW	PHKM5	5	5	7.0	8.6	-1.6	0.707	0.548	0.316	0.245	8	-4.00	0.004
1999	leaf number (# of leaves/plant)	PH4TW	PHKM5	5	5	17.4	15.4	2.0	0.548	1.517	0.245	0.678	8	2.77	0.024
1999	leaf number (# of leaves/plant)	PH4TW	PHKM5	5	5	16.4	14.6	1.8	0.894	0.894	0.400	0.400	8	3.18	0.013
1999	leaf number (# of leaves/plant)	PH4TW	PHKM5	5	5	16.0	14.8	1.2	0.707	0.447	0.316	0.200	8	3.21	0.012
1999	tassel primary branch (# of primary branches)	PH4TW	PHKM5	5	5	10.0	4.4	5.6	3.536	0.548	1.581	0.245	8	3.50	0.008
1999	tassel primary branch (# of primary branches)	PH4TW	PHKM5	5	5	8.0	4.2	3.8	2.828	0.837	1.265	0.374	8	2.88	0.020
1999	tassel primary branch (# of primary branches)	PH4TW	PHKM5	5	5	8.8	3.2	5.6	2.683	1.304	1.200	0.583	8	4.20	0.003

Table 1B: Summary data from Johnston, IA across environments in 1999 are supporting evidence for differences between PH4TW and PHKM5. Locations had different environmental conditions. Environments had different planting dates and were in different fields. Tables below show means broken out across environments in 1999.

Year	Traits	variety-1	variety-2	Count -1	Count -2	Mean -1	Mean -2	Mean Diff	StdDeviation-1	StdDeviation-2	StdError-1	StdError-2	DF Pooled	t-Value Pooled	Prob (2-tail) Pooled
1999	cob diameter (mm)	PH4TW	PHKM5	15	15	19.1	15.2	3.9	1.387	0.862	0.358	0.223	28	9.17	0.000
1999	ear weight (g)	PH4TW	PHKM5	15	15	31.9	44.0	-12.1	5.768	5.490	1.489	1.418	28	-5.90	0.000
1999	kernel length (mm)	PH4TW	PHKM5	15	15	6.9	9.2	-2.3	0.594	0.676	0.153	0.175	28	-9.76	0.000
1999	leaf number (# of leaves/plant)	PH4TW	PHKM5	15	15	16.6	14.9	1.7	0.910	1.033	0.235	0.267	28	4.69	0.000
1999	tassel primary branch (# of primary branches)	PH4TW	PHKM5	15	15	8.9	3.9	5.0	2.939	1.033	0.759	0.267	28	6.22	0.000

United States Department of Agriculture, Agricultural Marketing Service
 Science Division, Plant Variety Protection Office
 National Agricultural Library Building, Room 500
 Beltsville, MD 20705

200000251

Objective Description of Variety
 Corn (Zea mays L.)

Name of Applicant (s) Pioneer Hi-Bred International, Inc.	Variety Seed Source	Variety Name or Temporary Designation PH4TW
Address (Street & No., or RFD No., City, State, Zip Code and Country) 7301 NW 62nd Avenue, P.O. Box 85, Johnston, Iowa 50131-0085		FOR OFFICIAL USE
		PVP0 Number
Place the appropriate number that describes the varietal characters typical of this inbred variety in the spaces below. Right justify whole numbers by adding Leading zeroes if necessary. Completeness should be striven for to establish an adequate variety description. Traits designated by an '*' are considered Necessary for an adequate variety description and must be completed.		
COLOR CHOICES (Use in conjunction with Munsell color code to describe all color choices: describe #25 and #26 in Comments section):		
01=Light Green 02=Medium Green 03=Dark Green 04=Very Dark Green 05=Green-Yellow	06=Pale Yellow 07=Yellow 08=Yellow Orange 09=Salmon 10=Pink-Orange	11=Pink 12=Light Red 13=Cherry Red 14=Red 15=Red & White 16=Pale Purple 17=Purple 18=Colorless 19=White 20=White Capped 21=Buff 22=Tan 23=Brown 24=Bronze 25=Variegated (Describe) 26=Other (Describe)
STANDARD INBRED CHOICES (Use the most similar (in background and maturity) of these to make comparisons based on grow-out trial data):		
Yellow Dent Families:	Yellow Dent (Unrelated):	Sweet Corn:
Family Members	Co109, ND246, Oh7, T232, W117, W153R, W18BN	C13, Iowa5125, P39, 2132
B14 CM105, A632, B64, B68		Popcorn:
B37 B37, B76, H84		SG1533, 4722, HP301, HP7211
B73 N192, A679, B73, NC268		Pipcorn:
C103 Mo17, Va102, Va35, A682		Mo15W, Mo16W, Mo24W
Oh43 A619, MS71, H99, Va26	White Dent:	
WF9 W64A, A554, A654, Pa91	C166, H105, Ky228	

Groups on Lynx/Osborn/Grunst/98-99PVP

EXHIBIT C: PH4TW

1. TYPE: (describe intermediate types in Comments section):			Standard Variety Name		
<u>2</u>	1=Sweet 2=Dent 3=Flint 4=Flour 5=Pop 6=Ornamental	(DENT LIKE)	<u>A554</u>		
2. REGION WHERE DEVELOPED IN THE U.S.A.:			Standard Seed Source		
<u>2</u>	1=Northwest 2=Northcentral 3=Northeast 4=Southeast 5=Southcentral 6=Southwest 7=Other		<u>AMES 19305</u>		
3. MATURITY (In Region of Best Adaptability; show Heat Unit formula in 'Comments' section)			DAYS HEAT UNITS		
<u>064</u>	<u>1,131.0</u>	From emergence to 50% of plants in silk	<u>065</u>	<u>1,159.3</u>	
<u>065</u>	<u>1,154.3</u>	From emergence to 50% of plants in pollen	<u>066</u>	<u>1,169.0</u>	
<u>003</u>	<u>0,067.0</u>	From 10% to 90% pollen shed	<u>003</u>	<u>0,071.0</u>	
		From 50% silk to optimum edible quality			
		From 50% silk to harvest at 25% moisture			
4. PLANT:			Standard Deviation Sample Size		
<u>155.3</u>	cm Plant Height (to tassel tip)	<u>15.01</u>	<u>03</u>	<u>163.0</u>	<u>05.29</u> <u>03</u>
<u>052.3</u>	cm Ear Height (to base of top ear node)	<u>03.21</u>	<u>03</u>	<u>055.7</u>	<u>05.77</u> <u>03</u>
<u>011.9</u>	cm Length of Top Ear Internode	<u>01.80</u>	<u>03</u>	<u>011.4</u>	<u>00.53</u> <u>03</u>
<u>0.0</u>	Average Number of Tillers	<u>00.02</u>	<u>03</u>	<u>0.0</u>	<u>00.03</u> <u>03</u>
<u>0.7</u>	Average Number of Ears per Stalk	<u>00.04</u>	<u>03</u>	<u>1.0</u>	<u>00.11</u> <u>03</u>
<u>2</u>	Anthocyanin of Brace Roots: 1=Absent 2=Faint 3=Moderate 4=Dark			<u>3</u>	
5. LEAF:			Standard Deviation Sample Size		
<u>07.2</u>	cm Width of Ear Node Leaf	<u>00.35</u>	<u>03</u>	<u>09.1</u>	<u>00.31</u> <u>03</u>
<u>64.7</u>	cm Length of Ear Node Leaf	<u>00.99</u>	<u>03</u>	<u>66.9</u>	<u>04.11</u> <u>03</u>
<u>06</u>	Number of leaves above top ear	<u>00.53</u>	<u>03</u>	<u>05</u>	<u>00.60</u> <u>03</u>
<u>17</u>	Degrees Leaf Angle (measure from 2nd leaf above ear at anthesis to stalk above leaf)	<u>03.04</u>	<u>03</u>	<u>22</u>	<u>04.41</u> <u>03</u>
<u>03</u>	Leaf Color (Munsell code)	<u>5GY34</u>		<u>03</u>	<u>5GY44</u>
<u>1</u>	Leaf Sheath Pubescence (Rate on scale from 1=none to 9=like peach fuzz)			<u>1</u>	
	Marginal Waves (Rate on scale from 1=none to 9=many)				
	Longitudinal Creases (Rate on scale from 1=none to 9=many)				
6. TASSEL:			Standard Deviation Sample Size		
<u>09</u>	Number of Primary Lateral Branches	<u>01.01</u>	<u>03</u>	<u>12</u>	<u>01.59</u> <u>03</u>
<u>34</u>	Branch Angle from Central Spike	<u>13.11</u>	<u>03</u>	<u>19</u>	<u>05.35</u> <u>03</u>
<u>45.7</u>	cm Tassel Length (from top leaf collar to tassel tip)	<u>02.61</u>	<u>03</u>	<u>45.9</u>	<u>02.39</u> <u>03</u>
<u>3</u>	Pollen Shed (rate on scale from 0=male sterile to 9=heavy shed)			<u>5</u>	
<u>17</u>	Anther Color (Munsell code)	<u>7.5RP36</u>		<u>07</u>	<u>5Y88</u>
<u>01</u>	Glume Color (Munsell code)	<u>5GY58</u>		<u>01</u>	<u>5GY66</u>
<u>1</u>	Bar Glumes (Glume Bands): 1=Absent 2=Present			<u>1</u>	
Application Variety Data			Standard Variety Data		

200000251

Application Variety Data

PH4TW

Page 2

Standard Variety Data

7a. EAR (Unhusked Data):

<u>11</u> Silk Color (3 days after emergence) (Munsell code)	<u>10R64</u>	<u>07</u> <u>2.5GY96</u>
<u>01</u> Fresh Husk Color (25 days after 50% silking) (Munsell code)	<u>5GY68</u>	<u>01</u> <u>5GY78</u>
<u>21</u> Dry Husk Color (65 days after 50% silking) (Munsell code)	<u>2.5Y92</u>	<u>21</u> <u>2.5Y8.54</u>
<u>3</u> Position of Ear at Dry Husk Stage: 1= Upright 2= Horizontal 3= Pendant		<u>3</u>
<u>3</u> Husk Tightness (Rate of Scale from 1=very loose to 9=very tight)		<u>7</u>
<u>2</u> Husk Extension (at harvest): 1=Short (ears exposed) 2=Medium (<8 cm)		<u>2</u>
3=Long (8-10 cm beyond ear tip) 4=Very Long (>10 cm)		

7b. EAR (Husked Ear Data):

	Standard Deviation	Sample Size	Standard Deviation	Sample Size
<u>11.7</u> cm Ear Length	<u>00.58</u>	<u>03</u>	<u>09.7</u> <u>00.58</u>	<u>03</u>
<u>29.3</u> mm Ear Diameter at mid-point	<u>00.58</u>	<u>03</u>	<u>39.3</u> <u>01.15</u>	<u>03</u>
<u>031.7</u> gm Ear Weight	<u>01.53</u>	<u>03</u>	<u>67.0</u> <u>06.24</u>	<u>03</u>
<u>14</u> Number of Kernel Rows	<u>00.00</u>	<u>03</u>	<u>14.0</u> <u>00.00</u>	<u>03</u>
<u>2</u> Kernel Rows: 1=Indistinct 2=Distinct			<u>2</u>	
<u>2</u> Row Alignment: 1=Straight 2=Slightly Curved 3=Spiral			<u>1</u>	
<u>17.3</u> cm Shank Length	<u>05.69</u>	<u>03</u>	<u>11.7</u> <u>03.79</u>	<u>03</u>
<u>2</u> Ear Taper: 1=Slight 2= Average 3=Extreme			<u>2</u>	

8. KERNEL (Dried)

	Standard Deviation	Sample Size	Standard Deviation	Sample Size
<u>07.0</u> mm Kernel Length	<u>00.00</u>	<u>03</u>	<u>10.3</u> <u>00.58</u>	<u>03</u>
<u>06.3</u> mm Kernel Width	<u>00.58</u>	<u>03</u>	<u>08.0</u> <u>00.00</u>	<u>03</u>
<u>04.7</u> mm Kernel Thickness	<u>00.58</u>	<u>03</u>	<u>04.0</u> <u>00.00</u>	<u>03</u>
<u>27.3</u> % Round Kernels (Shape Grade)	<u>17.90</u>	<u>03</u>	<u>28.7</u> <u>02.31</u>	<u>03</u>
<u>1</u> Aleurone Color Pattern: 1-Homozygous 2=Segregating			<u>1</u>	
<u>07</u> Aleurone Color (Munsell code)	<u>1.25Y712</u>		<u>07</u> <u>2.5Y812</u>	
<u>07</u> Hard Endosperm Color (Munsell code)	<u>1.25Y714</u>		<u>07</u> <u>2.5Y812</u>	
<u>03</u> Endosperm Type:			<u>3</u>	
1=Sweet (Su1) 2=Extra Sweet (sh2) 3=Normal Starch				
4=High Amylose Starch 5=Waxy Starch 6=High Protein				
7=High Lysine 8=Super Sweet (se) 9=High Oil				
10=Other _____				
<u>12.3</u> gm Weight per 100 Kernels (unsized sample)	<u>02.08</u>	<u>03</u>	<u>22.00</u> <u>02.65</u>	<u>03</u>

9. COB:

	Standard Deviation	Sample Size	Standard Deviation	Sample Size
<u>19.0</u> mm Cob Diameter at mid-point	<u>01.00</u>	<u>03</u>	<u>24.3</u> <u>00.58</u>	<u>03</u>
<u>19</u> Cob Color (Munsell code)	<u>5Y91</u>		<u>14</u> <u>10R48</u>	

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10. DISEASE RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant);
leave blank if not tested; leave Race or Strain Options blank if polygenic):

A. Leaf Blights, Wilts, and Local Infection Diseases

- Anthracnose Leaf Blight (*Colletotrichum graminicola*)
 Common Rust (*Puccinia sorghi*)
 Common Smut (*Ustilago maydis*)
6 Eyespot (*Kabatiella zeae*)
 Goss's Wilt (*Clavibacter michiganense* spp. *nebraskense*)
 Gray Leaf Spot (*Cercospora zeae-maydis*)
 Helminthosporium Leaf Spot (*Bipolaris zeicola*) Race _____
 Northern Leaf Blight (*Exserohilum turcicum*) Race _____
 Southern Leaf Blight (*Bipolaris maydis*) Race _____
 Southern Rust (*Puccinia polysora*)
 Stewart's Wilt (*Erwinia stewartii*)
 Other (Specify) _____

3

B. Systemic Diseases

- Corn Lethal Necrosis (MCMV and MDMV)
 Head Smut (*Sphacelotheca reiliana*)
 Maize Chlorotic Dwarf Virus (MDV)
 Maize Chlorotic Mottle Virus (MCMV)
 Maize Dwarf Mosaic Virus (MDMV)
 Sorghum Downy Mildew of Corn (*Peronosclerospora sorghi*)
 Other (Specify) _____

C. Stalk Rots

- Anthracnose Stalk Rot (*Colletotrichum graminicola*)
 Diplodia Stalk Rot (*Stenocarpella maydis*)
 Fusarium Stalk Rot (*Fusarium moniliforme*)
 Gibberella Stalk Rot (*Gibberella zeae*)
 Other (Specify) _____

D. Ear and Kernel Rots

- Aspergillus Ear and Kernel Rot (*Aspergillus flavus*)
 Diplodia Ear Rot (*Stenocarpella maydis*)
 Fusarium Ear and Kernel Rot (*Fusarium moniliforme*)
 Gibberella Ear Rot (*Gibberella zeae*)
 Other (Specify) _____

11. INSECT RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant); (leave blank if not tested) :

Banks grass Mite (*Oligonychus pratensis*)
 Corn Worm (*Helicoverpa zea*)
 Leaf Feeding
 Silk Feeding
 mg larval wt.
 Ear Damage
 Corn Leaf Aphid (*Rhopalosiphum maidis*)
 Corn Sap Beetle (*Carpophilus dimidiatus*)
 European Corn Borer (*Ostrinia nubilalis*)
 1st Generation (Typically Whorl Leaf Feeding)
 2nd Generation (Typically Leaf Sheath-Collar Feeding)
 Stalk Tunneling
 cm tunneled/plant
 Fall Armyworm (*Spodoptera frugiperda*)
 Leaf Feeding
 Silk Feeding
 mg larval wt.
 Maize Weevil (*Sitophilus zeamais*)
 Northern Rootworm (*Diabrotica barberi*)
 Southern Rootworm (*Diabrotica undecimpunctata*)
 Southwestern Corn Borer (*Diatraea grandiosella*)
 Leaf Feeding
 Stalk Tunneling
 cm tunneled/plant
 Two-spotted Spider Mite (*Tetranychus urticae*)
 Western Rootworm (*Diabrotica virgifera virgifera*)
 Other (Specify) _____

12. AGRONOMIC TRAITS:

<u>1</u>	Staygreen (at 65 days after anthesis) (Rate on a scale from 1=worst to excellent)	<u>2</u>
<u>0.0</u>	% Dropped Ears (at 65 days after anthesis)	<u>0.0</u>
	% Pre-anthesis Brittle Snapping	
	% Pre-anthesis Root Lodging	
<u>10.5</u>	Post-anthesis Root Lodging (at 65 days after anthesis)	<u>39.6</u>
<u>2,847.9</u>	Kg/ha Yield of Inbred Per Se (at 12-13% grain moisture)	<u>2,228.5</u>

13. MOLECULAR MARKERS: (0=data unavailable; 1=data available but not supplied; 2=data supplied):

1 Isozymes

0 RFLP's

0 RAPD's

COMMENTS (eg. state how heat units were calculated, standard inbred seed source, and/or where data was collected. Continue in Exhibit D):

CLARIFICATION OF DATA IN EXHIBITS B AND C

Please note the data presented in Exhibit C, "Objective Description of Variety," are collected primarily at Johnston and Ankeny, Iowa. The data in Exhibit B are from comparisons of inbreds in Johnston and Ankeny, IA. The data in Tables 1A and 1B are from paired comparisons collected in Johnston and Ankeny, IA. These traits collectively show distinct differences between the two varieties.

The data collected in exhibit C were collected from environments 1999 for page 1 and 2. There are factors that differ from environment to environment. The environments had different planting dates. Environmental temperature and precipitation differences during the vegetative and grain fill periods can impact plant and grain traits and be a source of variability. These data are mostly based on 5 plants measured at each location. There often is more variability associated with environment to environment factors than within locations. Please see Table 3 for average temperature and rainfall information in 1999. In addition, this variety showed susceptibility to Stewarts Wilt in 1999. A high population of flea beetles in 1999 at 2 of our locations may have contributed more variability than usual resulting in higher standard deviations for some traits.

The number of ears per stalk was small probably due to susceptibility to Stewarts Wilt disease that caused many of the plants to go barren. One location in particular had high flea beetle populations and severe Stewarts Wilt.

It appears as though no data was available for Goss's Wilt, Stewart's Wilt, Head Smut, and Giberella Ear Rot for variety PH4TW in 1997, 1998 and 1999 in our disease tests conducted throughout Pioneer Hi-Bred Int., Inc. Since page 3 and 4 of exhibit C are based on a paired comparison, there are no corresponding data values for variety A554 resulting in the difference that you noted for 200000254 and 200000251.

JMS
12/14/01

Table 3. Temperature and Rainfall

TEMPERATURE

YEAR	MAY	JUN	JULY	AUG	AVERAGE
1994	59.8	70.7	71.9	69.0	67.9
1995	56.2	69.4	74.3	76.9	69.2
1996	56.2	69.3	71.3	70.5	66.8
1997	53.5	70.6	74.1	69.6	67.0
1998	64.7	66.6	74.8	73.5	69.9
1999	60.7	69.7	78.7	70.5	69.9

RAINFALL

YEAR	MAY	JUN	JULY	AUG	Total
1994	3.67	5.75	1.71	4.18	15.31
1995	5.04	4.19	2.94	2.87	15.04
1996	8.47	4.35	2.51	2.14	17.47
1997	4.32	3.27	4.10	1.36	13.05
1998	6.46	11.07	5.70	4.96	28.19
1999	6.46	4.54	4.45	6.55	21.85

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U. S. C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) PIONEER HI-BRED INTERNATIONAL, INC.	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME PH4TW
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) 7301 NW 62nd AVENUE P.O. BOX 85 JOHNSTON, IA 50131-0085	5. TELEPHONE (include area code) 515-270-4051	6. FAX (include area code) 515-253-2125
7. PVPO NUMBER 2000002511		

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain: ☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? ☒ YES ☐ NO

If no, give name of country

10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If original rights to variety were owned by individual(s), is(are) the original owner(s) a U.S. national(s)?

☐ YES ☐ NO If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

☒ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (if needed, use reverse for extra space):

PH4TW is owned by Pioneer Hi-Bred International, Inc.

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country Which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See section 41(a)(2) of the Plant Variety Protection Act for definition.

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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